

## **Appendix N**

### **Calculation of Cumulative Phosphorous Impacts**

If any part of two drainfields overlap, as measured in the direction of ground-water flow, cumulative impacts must be addressed. To determine the cumulative effects for two drainfields, the phosphorous equation should be completed using the distance from the upgradient drainfield through the downgradient drainfield as the “distance from drainfield to surface water” in the equation. If breakthrough is greater than 50 years, there is no cumulative effect and the phosphorous equation should be run as usual from the downgradient drainfield. If breakthrough is greater than 50 years, the additional difference is NOT applied to the next set of drainfield calculations. However, if breakthrough from the first to the second drainfield is less than 50 years, the calculations for the downgradient drainfield must account for the cumulative effects. For example, if the breakthrough from the upgradient to downgradient drainfield is 35 years, then the breakthrough from the downgradient drainfield to surface water must account for the additional 15 years. Therefore, the breakthrough for the downgradient drainfield must be at least 65 years (50 years plus the 15 years leftover from the first drainfield) to the surface water to be nonsignificant degradation of state waters.

For Example 1 (see following page), the distance between drainfield A and drainfield B is 100 feet and the time to breakthrough is 37.9 years. Because this is less than the 50 year breakthrough required to be nonsignificant, 12.1 years must be added to the breakthrough for the next drainfield (50 years minus 37.9 years). In this example, the breakthrough from drainfield B to drainfield C is the same breakthrough time as A to B. The total shortage breakthrough time for these two drainfields, 24.2 years, must be added to the time for breakthrough for the final drainfield to the surface water, 50 years + 24.2 years. Therefore drainfield C needs 74.2 years to breakthrough to the surface water in order to be determined nonsignificant. In Example 1, the breakthrough is 68.9 years and fails the phosphorous breakthrough requirement.

Example 2 demonstrates how drainfields that are skewed to the direction of ground-water flow are used in the calculation of cumulative effects.

Remember that phosphorous breakthrough is calculated to the nearest surface water if the ground-water flow direction was determined by using 1/3 regional topography. If the ground-water flow direction was determined by an acceptable published source or by measuring water levels in surveyed wells, then the nearest surface water in the direction of ground-water flow is considered for phosphorous breakthrough.